IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

KEWAZINGA CORP.,	)	
Plaintiff,	)	Civil Action No. 1:20-cv-01106-LGS
vs.	)	
GOOGLE LLC,	)	
Defendant.	)	

CLAIM CONSTRUCTION EXPERT REPORT AND DECLARATION OF JEFFREY LUBIN, Ph.D.

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I, Jeffrey Lubin, hereby declare that:

1. I have been retained by Kewazinga Corp.'s ("Kewazinga") counsel as a consultant and expert in this action. I was asked to investigate and provide my opinions regarding the interpretation of certain language in the claims of Kewazinga's United States Patent Nos. 6,535,226 ("the '226 patent," Exhibit A), 6,522,325 ("the '325 patent," Exhibit B), and 9,055,234 ("the '234 patent," Exhibit C) (collectively, "the Asserted Patents").

2. This report and declaration is based upon information currently known to me and I reserve the right to rely upon any additional information I become aware of after the date of this report and declaration. In addition, I reserve the right to respond to any arguments or opinions regarding the subject matter of this report and declaration raised by Google LLC ("Google") or its experts after the date of this report and declaration, including in a reply expert report and declaration and/or at any hearing or trial.

I. PROFESSIONAL BACKGROUND AND QUALIFICATIONS

3. I am a Senior Research Scientist at SRI International, where I am the Principal Investigator, Program Manager, and chief inventor responsible for a variety of different technology areas in video, image and speech processing.

4. I received a Ph.D. in Experimental Psychology, with a specialization in the modeling of perceptual processes in analyzing and understanding visual motion, from the University of Pennsylvania in 1992, and a B.A. in Psychology, with Honors from Swarthmore College in 1981.

5. I have more than 30 years' experience leading and inventing solutions in advanced research and development initiatives in image, video, speech and motion processing. I

am highly experienced in world-class research and development environments, serving U.S. government, non-profit and commercial clients.

6. A complete copy of my curriculum vitae, which includes a list of my publications and patents, is attached as Exhibit D. I have never served as an expert or provided expert testimony in a legal proceeding prior to this case.

7. The following list includes some highlights from my educational background and professional experience:

- Ph.D., University of Pennsylvania; Dissertation: Modeling of Motion Perception in Human Vision; Cattell Award honoree for best dissertation in Psychology
- BA with Honors, Swarthmore College; Senior Thesis: Pattern recognition mechanisms in human vision
- Senior Research Scientist at SRI International, and previously Member of Technical Staff and Senior Member of Technical Staff at the former David Sarnoff Research Center and Sarnoff Corporation (before its acquisition by SRI) for over 30 years, attracting and managing several million dollars in annual revenue from U.S. Government and commercial sources, and managing cross-company and cross-disciplinary teams on projects involving image, video and speech processing
- Development of computer vision algorithms for manufacturing inspection at an early startup in robotics and computer vision
- Over 30 issued patents and a dozen publications
- Pioneer in areas including motion-estimation-based tweening, image and video alignment for multi-frame image and video enhancement, multi-frame and multi-camera 3D object recovery, video image quality analysis, temporal behavior-based biometrics and biometric spoof detection, cinema watermarking, video tamper detection, and realistic video rendering of human faces and voices through machine learning techniques
- Technical Emmy for development of system for automatic estimation of motion picture and television image quality
- Development of world's only digital cinema watermark that is invisible to Hollywood "golden eyes" but robust to extreme degradation

- Development of robust techniques for biometric spoof detection using analysis of detailed skin dynamics
- Development of remote measurement and experimental techniques for human stress resilience measurement and training
- Development of robust techniques for realistic human face and voice rendering using machine learning
- Development of motion-sensor-based techniques for fall risk estimation in the elderly

II. COMPENSATION

8. My compensation for this assignment is $300 per hour and $400 per hour for deposition or trial. My compensation is not dependent on the substance of my opinions or my testimony or the outcome of this proceeding, and I have no financial interest in this case.

III. PRIOR TESTIMONY

9. I have not testified as an expert at trial or deposition in the previous four years in any case.

IV. MATERIALS CONSIDERED

10. I have considered the following materials, facts, and data in forming my opinions in this action:

- Joint Claim Construction and Prehearing Statement (including Exhibit 1) ("Joint Claim Construction Statement," Exhibit E), as well as the intrinsic and extrinsic evidence identified by both parties in the Joint Claim Construction Statement;
- The Asserted Patents and their file histories (including U.S. Patent No. 5,649,032 ("Burt patent," Exhibit F) which is incorporated by reference in the '325 and '234 patents);

- Claim Construction Opinion, *Kewazinga Corp. v. Microsoft Corp.*, No. 1:18-CV-4500-GHW ("*Kewazinga v. Microsoft*"), (S.D.N.Y. July 29, 2019), ECF No. 53. ("*Kewazinga v. Microsoft* Claim Construction Opinion," Exhibit G); and
- The additional references cited herein.

11. I also base my opinions below on my professional training and experience.

12. In addition, I have reviewed Dr. Keith Hanna's declarations and deposition testimony submitted in connection with the *Kewazinga v. Microsoft* case. While I did not rely on those materials in forming my opinions in this case, which are based on my independent analysis of the intrinsic and extrinsic evidence, I generally agree with the substance of Dr. Hanna's declarations and testimony.

V. APPLICABLE LEGAL STANDARDS

13. I am not an attorney and do not intend to testify concerning the law that should be applied. In forming my opinions in this case, I used the following legal framework that was explained to me by counsel.

14. I understand that claim construction is the process by which a court determines the scope and meaning of terms used in the claims of a patent. I further understand that the goal of this process is to give claim terms the ordinary and customary meaning they would have had to a person of ordinary skill in the art ("POSITA") at the time of the invention (*i.e.*, at the time of the filing of the patent application).

15. I understand that the claims of a patent must be read in view of the specification but particular embodiments may not be used to narrow the claims, and claims are not generally limited to particularly embodiments. I have been informed that a claim term should be construed to include limitations not otherwise inherent in the term only when a patentee sets out a

definition and acts as his own lexicographer, or when the patentee disavows the full scope of a claim term either in the specification or during prosecution. I understand that a patentee is free to choose a broad term and can expect to obtain the full scope of its plain and ordinary meaning unless the patentee explicitly redefines the term or disavows its full scope.

16. I understand that, in some cases, the court may consider extrinsic evidence, such as technical dictionaries, in construing claim terms. I have been informed that such extrinsic evidence is less significant than the intrinsic evidence such as the claims, specification, and prosecution history, which provide substantial guidance as to the meaning of the claim terms.

VI. LEVEL OF SKILL IN THE ART

17. Based on my experience, I believe that a person of ordinary skill in the art of the Asserted Patents at the time each was filed would have an educational background in topics relevant to the field of computer vision, image processing, computational methods for image and video analysis, or equivalent field, and 3-5 years of experience in the field of computer vision, image processing, computational methods for image and video analysis, or equivalent field.

VII. TECHNOLOGY OVERVIEW OF THE ASSERTED PATENTS

18. The ‘226 patent issued on March 18, 2003, from a patent application, U.S. Patent Application No. 09/283,413 (“the ‘413 application”), filed on April 1, 1999. I understand that the ‘226 patent claims the benefit of U.S. Provisional Patent Application No. 60/080,413, filed on April 2, 1998.

19. The ‘325 patent issued on February 18, 2003, from a patent application, U.S. Patent Application No. 09/419,274 (“the ‘274 application”), filed on October 15, 1999. I understand that the ‘325 patent claims priority to the patent application that issued as the ‘226

patent ('413 application), which claims the benefit of U.S. Provisional Patent Application No. 60/080,413.

20. The '234 patent issued on June 9, 2015, from a patent application, U.S. Patent Application No. 14/505,208 ("the '208 application"), filed on October 2, 2014. I understand that the '234 patent claims priority, through a series of patent applications, to the '413 application, which claims the benefit of U.S. Provisional Patent Application No. 60/080,413.

21. The Asserted Patents are directed to telepresence systems and methods that enable multiple users to each smoothly and independently navigate along paths through a remote environment. *See, e.g.,* Ex. B ('325 patent) at 4:6-8. The paths are defined by sequences of images captured from within the environment.

22. Though I have been informed that patent claims are not limited to their embodiments, for illustrative purposes I describe herein Figures 1, 9, and 10 of the Asserted Patents, which show the general structure of one illustrative embodiment of the invention. For convenience, I generally include citations to one of the Asserted Patents though similar or identical language to that cited may be found in the other Asserted Patents. As shown in Figures 1, 9 and 10 and described in the Asserted Patents, the sequential images are captured by an array 10 of cameras 14 (which is composed of a plurality of sub-arrays 12) positioned within the environment and are sent to a server 18 via local area hubs 16. Ex. B ('325 patent) at 4:52-56, 5:21-23. Server 18 processes the received images for storage in electronic storage device 20, transmission to users 22 or both. Ex. B ('325 patent) at 4:52-56, 5:34-36. As explained in the Asserted Patents, "[e]ach user 22 has associated therewith a user interface device including a user display device (collectively 24)" for interacting with the server 18. Ex. B ('325 patent) at 5:53-56, 5:67-6:2. Examples of such user interface devices include, a "computer 24-1," "an

interactive wall screen 24-2," "a mobile audio and image appliance 24-3," and a "digital interactive TV 24-4." Ex. B ('325 patent) at 6:2-10. Each user device may be coupled to the server 18 by an independent communication link, such as "an internet link, a microwave signal link, a satellite link, a cable link, a fiber optic link, a wireless link, and the like." Ex. B ('325 patent) at 6:30-36.

23. The user interface devices allow each user to navigate through the array, and thus through the environment, by viewing camera outputs stored at particular locations in memory, also referred to as "nodes." *See, e.g.,* Ex. B ('325 patent) at Abstract, 19:64-67. As stated in the Asserted Patents: "[U]ser inputs allow each user 22 to move or navigate independently through the array 10. In other words, each user 22 enters inputs to generally select which camera outputs are transferred to the user display device." Ex. B ('325 patent) at 6:19-23. "When the image to be displayed has previously been stored in the storage device 20, the CPU 904 causes the memory controller 910 to access the storage device 20 to retrieve the appropriate camera output." Ex. B ('325 patent) at 17:29-32, 17:65-18:12. Generally, navigation is accomplished by incrementing or decrementing the node address based on user inputs, indicating, for example, moving to the right, left, up, down, forward, and backward. Ex. B ('325 patent) at 8:28-49; *see also, e.g.,* Ex. B ('325 patent) at 8:60-63 (in order to move to the right, "the current node address is incremented along the X axis in step 150 to obtain an updated address"). As a result, navigation through the array is not limited only to movement from one physical camera to another physical camera, but rather includes navigation of camera outputs: "the System allows the viewer to float between a multiplicity of microcamera outputs in a way that, via electronic switching (and thus movement through the array), merges their fields of view into a seamless motion path." Ex. A ('226 patent) at 4:26-29.

24. In this illustrative embodiment, the array 10 is generally described as "compris[ing] a series of modular rail arrays 12 carrying microcameras 14." Ex. B ('325 patent) at 6:64-66. The specification explains that one advantage of such an array is that "no individual camera, or the entire array 10 for that matter, need be moved in order to obtain a seamless view of the environment," and that instead, the user navigates through the array 10, which is placed through the environment to be viewed. Ex. B ('325 patent) at 6:37-43. The specification distinguishes this from "investing the viewer with the capacity to physically move a robotic camera" in order to navigate through the environment, "which would immediately limit the number of viewers that could simultaneously control their own course" through the environment. *See, e.g.,* Ex. B ('325 patent) at 4:32-35.

25. The Asserted Patents are not limited to an array of fixed, stationary cameras. For example, the specification explains that the "array 10 can be secured to a moveable frame that can be wheeled into position in the environment" and that "virtually any configuration of rails 12 and cameras 14 is within the scope of the present invention." Ex. B ('325 patent) at 7:32-34, 7:41-45. The specification also explains that while "the communication links 15 between the cameras 14 and the server 18 [are depicted] as being hardwired, it is to be understood that wireless links may be employed" (Ex. B ('325 patent) at 5:27-30), which provides flexibility in positioning and moving cameras to capture images.

26. Figure 11 of the '325 and '234 patents, shown below, further illustrates that the Asserted Patents are not limited to an array of fixed, stationary cameras. In particular, as explained in further detail below, Figure 11 shows an embodiment in which a single "array of cameras," labeled as "10," comprises the collection of a "plurality of cylindrical arrays" (labeled as "12-1" to "12-n"), each of which is a separate "array of cameras" that is sequentially

positioned through an environment at different times to capture images. Ex. B ('325 patent) at 19:5-20:53, Fig. 11, Fig. 12. Each cylindrical "array of cameras" (12-1 to 12-n) can be comprised of a plurality of ring-shaped "arrays of cameras." Ex. B ('325 patent) at 19:13-16.

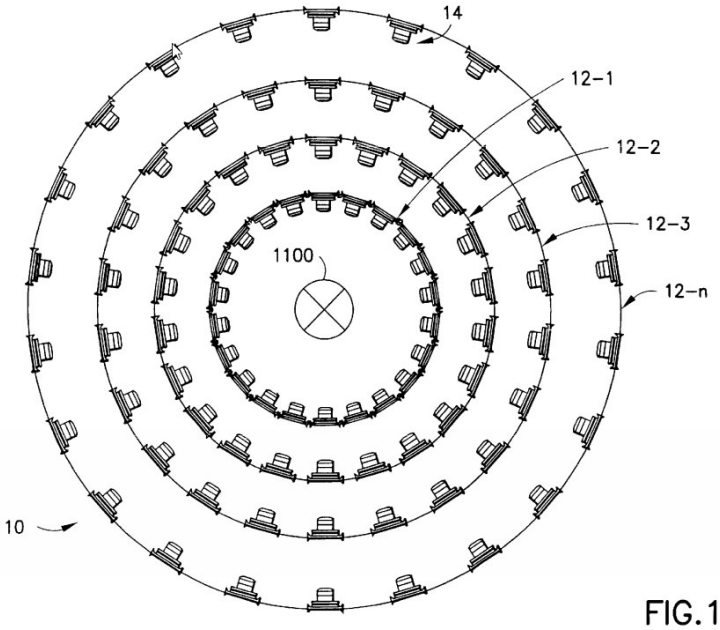


FIG. 11

27. The embodiment in Figure 11 is described "with respect to FIG. 11 and continuing reference to FIG. 1." Ex. B ('325 patent) at 18:64-19:1. Figure 1 of the '325 patent (as well as the '226 and '234 patents), shown below, is a block diagram depicting multiple "rail arrays" (labeled as 12), the collection of which comprises a single "array of cameras" (labeled as 10). Ex. B ('325 patent) at Fig. 1, 5:19-20 ("The array 10 comprises a plurality of rails 12, each rail 12 including a series of cameras 14."), 6:18-21.

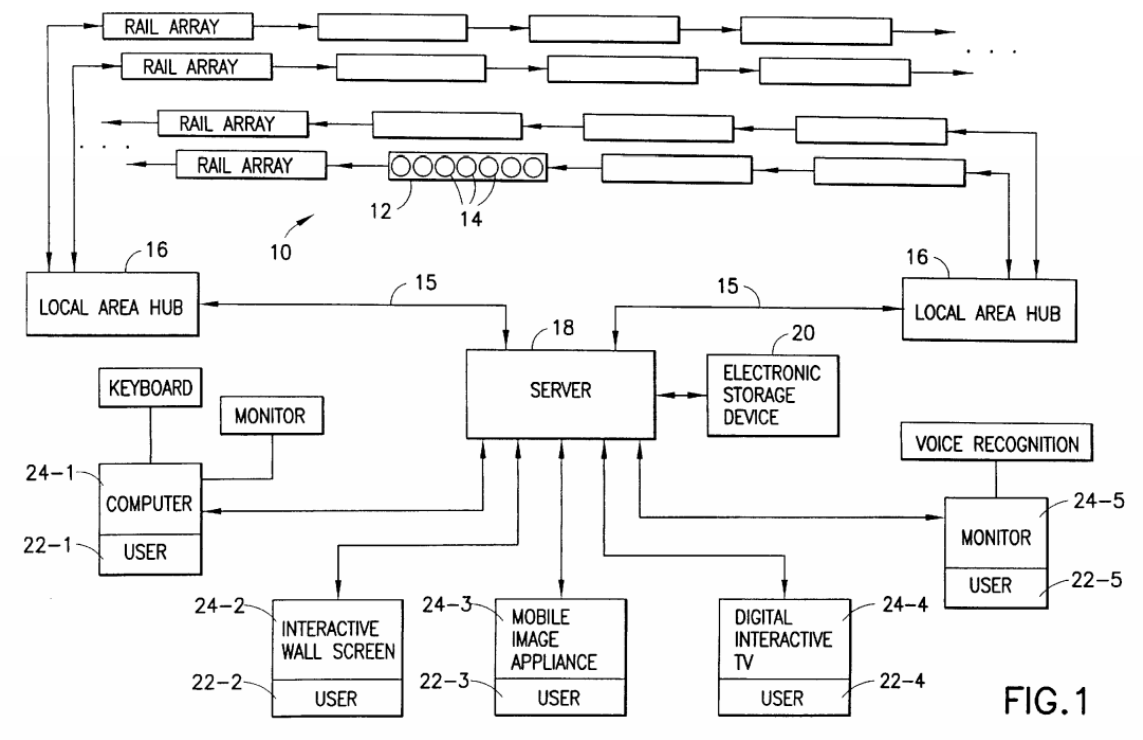


FIG. 1

28. Thus, a POSITA would understand label 10 in Figure 11 to identify a single "array of cameras" comprising the collection of the cylindrical "arrays of cameras" labeled as 12-1 to 12-n (*i.e.*, sub-arrays), particularly given that Figure 11 is described with "continuing reference to FIG. 1." Ex. B ('325 patent) at 18:64-19:1. In the Figure 11 embodiment, the cylindrical sub-arrays (12-1 to 12-n) capture images at different positions in an environment and at different times. For example, a first sub-array (*e.g.*, 12-1) is positioned at a location in the environment to capture and store images. Ex. B ('325 patent) at 19:5-26, 19:41-63. After that first sub-array captures and stores images, it is removed and then another sub-array (*e.g.*, 12-2) is positioned at a different location in the environment to capture and store images and so forth. Ex. B ('325 patent) at 19:5-26, 19:41-63. In this embodiment, the prior sub-arrays must be moved prior to positioning the later sub-arrays to capture images so that those prior sub-arrays do not block the view of the later sub-arrays. In other words, using my previous example, sub-

array 12-1 would need to be moved prior to capturing images with sub-array 12-2 so that the view of the cameras in sub-array 12-2 is not obstructed. Though Figure 11 depicts each cylindrical sub-array 12-1 to 12-n positioned in an environment, a POSITA would understand from the specification that each of those cylindrical sub-arrays is not positioned in the environment at the same time but, rather, at different times during the image capture process. Ex. B ('325 patent) at 19:5-26, 19:41-63. A POSITA would understand that Figure 11 thus depicts a single "array of cameras," identified as array 10, comprised of the collection of the sub-arrays (12-1 to 12-n) in different positions through an environment and at different times during the image capture process. Thus, the array 10 in the Figure 11 embodiment is created over time by moving cameras (as part of sub-arrays 12-1 to 12-n) to different positions through an environment and at different times during the image capture process.

29. In the Figure 11 embodiment, there is no requirement or discussion in the specification that there be exact or uniform distances between each of the cylindrical arrays 12-1 to 12-n (*i.e.*, sub-arrays) that are sequentially positioned through the environment at different times, the collection of which comprises array 10. *See* Ex. B ('325 patent) at 19:5-63. Similarly, there is no requirement or discussion in the specification that the distances between each of the sub-arrays 12-1 to 12-n is predetermined or known prior to image capture. *See* Ex. B ('325 patent) at 19:5-63. In fact, Figure 12 (a flowchart describing the Figure 11 embodiment) shows that, in the Figure 11 embodiment, the decision to position another sub-array is made during the image capture process (*i.e.*, after images have already begun being captured by a prior sub-array). In addition, Figure 11 identifies the sub-arrays as going to "12-n" (indicating an arbitrary number of sub-arrays can be used), which is consistent with the exact locations of each camera in

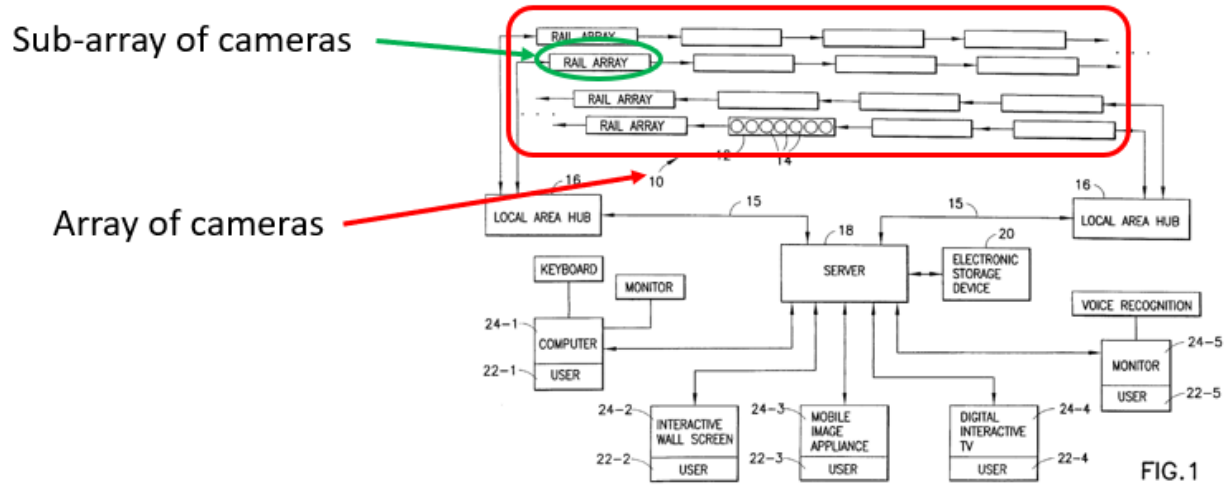
the sub-arrays 12-1 to 12-n (and, thus, in the single array 10) and distances between them not needing to be known prior to image capture.

30. Instead, the Asserted Patents describe the Figure 11 embodiment as having a known relationship between the cameras in each sub-array 12-1 to 12-n and array 10 based on "the number of camera positions along [an] axis [a] particular camera is displaced from a reference camera":

> In the present embodiment, for example, a coordinate value corresponding to an axis of a particular camera represents the number of camera positions along that axis the particular camera is displaced from a reference camera. In the present embodiment, from the user's perspective, the X axis runs around the perimeter of an array 12, and the Z axis runs down and up. Each storage node is associated with a camera view identified by its X, Z coordinate. Ex. B ('325 patent) at 19:19-26.

This coordinate system based on the known relationship in terms of camera positions permits user navigation of imagery stored in "nodes" associated with those coordinates, including navigation between the sub-arrays "to move forward and backward in an environment." Ex. B ('325 patent) at 19:41-20:27. This same relationship is described with respect to other embodiments in the Asserted Patents as well. *See, e.g.*, Ex. B ('325 patent) at 5:1-18, 14:41-49, Fig. 5. But, as is clear from Figure 12's explanation of the Figure 11 embodiment, this relationship need not be predetermined or known prior to image capture. Ex. B ('325 patent) at Fig. 12. Similarly, the fact that the Asserted Patents describe the known relationship between cameras based on displacement from a reference camera in terms of "camera positions," as opposed to certain distances, confirms that the embodiment does not require exact or uniform distances between the cameras or the sub-arrays. *See* Ex. B ('325 patent) at 19:19-26. As explained further below, "mosaicing" images captured by cameras does not require the exact distances between those cameras to be known. *See infra* at ¶ 35.

31. The Asserted Patents describe the array of cameras as comprising sub-arrays that are not connected to one another. For example, the embodiment of Figure 1 (shown annotated below) includes a single array of cameras (labeled as 10) comprised of multiple "rail arrays" of cameras (labeled as 12). *See* Ex. B ('325 patent) at 5:19-20, Fig. 1.



32. This same concept is demonstrated in the embodiment of Figure 3 (shown annotated below) which includes a single array of cameras (labeled as 10) comprised of multiple "rail arrays" of cameras (labeled as 12). *See* Ex. B ('325 patent) at 7:47-48, Fig. 3.

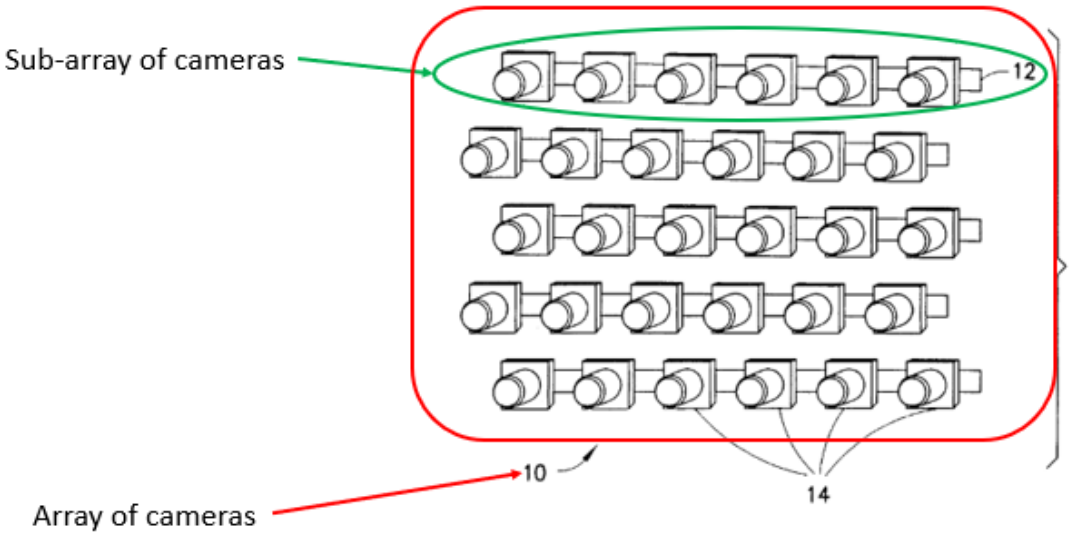
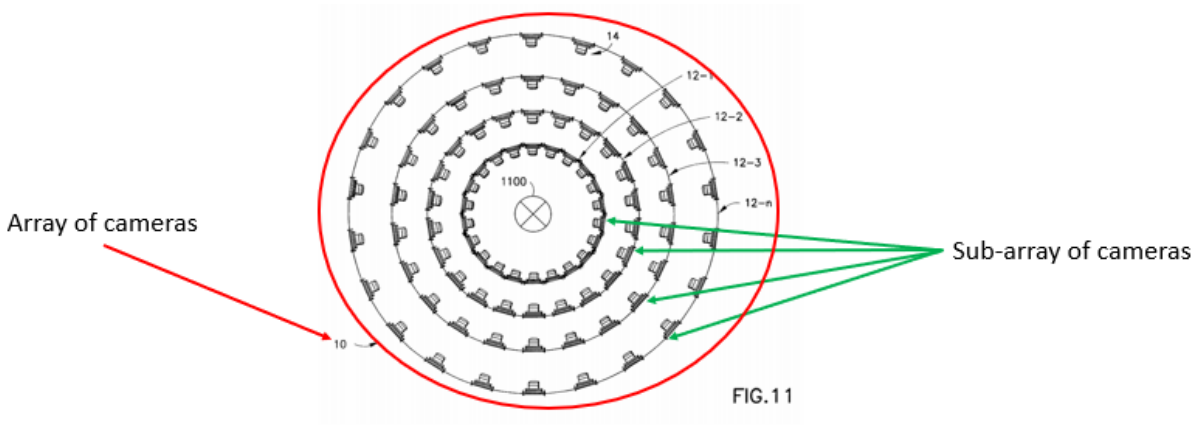


FIG.3

33. This is also demonstrated in the embodiment of Figure 11 (shown annotated below) which includes an array of cameras (depicted as number 10) comprised of a collection of cylindrical-shaped sub-arrays (depicted as number 12-1, 12-2, 12-3, and 12-n), which each, in turn, are comprised of multiple ring-shaped arrays. Ex. B ('325 patent) at 19:5-26. Each ring-shaped array forming each cylindrical array 12 is not separately depicted but each is a sub-array of the cylindrical array 12 that it is part of. Each cylindrical array 12 is a sub-array of the array of cameras 10.



34. As described above, navigation through the array and, accordingly, through the environment, is generally accomplished by incrementing or decrementing the node address based on user inputs. Ex. B ('325 patent) at 8:28-49.

35. The '325 and '234 patents also describe "mosaicing" techniques. "Mosaicing" refers to creating imagery assembled from a plurality of images, or portions thereof, including an alignment process and a composition process. Ex. B ('325 patent) at 13:15-28. In an embodiment of "mosaicing" described in the '325 and '234 patents, first "[t]he server 18 automatically aligns one camera output to another camera output, a camera output to another mosaic (generated from previously occurring camera output) such that the output can be added to the mosaic, or an existing mosaic to a camera output." Ex. B ('325 patent) at 13:21-25. Second,

the server "utilizes a mosaic composition process to construct (or update) a mosaic," which, in turn, "comprises a selection process and a combination process." Ex. B ('325 patent) at 13:26-30. The selection process "automatically selects outputs for incorporation into the mosaic and may include masking and cropping functions to select the region of interest in a mosaic." Ex. B ('325 patent) at 13:30-32. A POSITA would understand that the selection process may not constitute a discrete step, particularly where there is no need to identify particular "regions of interest" (within images) to be "mosaiced." *See* Ex. F (Burt patent) at Fig. 5. The combination process then combines the various outputs, for example, by "merging, fusing, filtering, output enhancement, and the like," to form the mosaic. Ex. B ('325 patent) at 13:35-38. As described in the specification, a mosaic may be formed on the fly (as the user moves through the system) or beforehand. Ex. B ('325 patent) at 13:41-49 ("In one embodiment of the present invention, the mosaic may be formed as the user moves through the system (on the fly) and the output image displayed close to real time. In another embodiment, the system may form the mosaic from a predetermined number of outputs or during a predetermined time interval, and then display the images pursuant to the user's navigation through the environment."). Furthermore, a POSITA would understand that "mosaicing" does not require images captured by stationary cameras (or images captured by cameras at all). Rather, "mosaicing" can be performed on images captured by moving cameras, even where the exact distances between those cameras is not known. This can include images captured by a camera panning at one location (*e.g.*, rotating it left or right) (*see, e.g.,* Ex. F (Burt patent) at 16:58-60) and/or images captured one or more cameras moving to different locations.

VIII. CLAIM CONSTRUCTION AND ANALYSIS

36. I understand that the parties dispute the construction of the following two claim terms found in the Asserted Patents:

- "mosaicing" (325 patent, claims 1, 5, 6)
- "array of cameras" ('226 patent, claims 55, 119; '325 patent, 1, 5, 6, 10, 14, 15, 29)

37. Below I provide my opinion regarding how a person of ordinary skill in the art would understand each of these terms.

A. "mosaicing" ('325 patent, claims 1, 5, 6)

38. Claims 1, 5, and 6 of the '325 patent recite "mosaicing." A POSITA would understand that this term refers to *creating imagery assembled from a plurality of images, or portions thereof, including an alignment process and a composition process*.

39. I understand that that the parties have agreed that other claim terms reciting the word "mosaicing" or variants (*e.g.*, "mosaic imagery") should be construed in accordance with the construction of the term "mosaicing" and need not be separately or additionally construed. This includes the following terms, as set forth in the Joint Claim Construction Statement (Exhibit E):

- "mosaic imagery" ('234 patent, claims 1, 3, 13, 16)
- "mosaic images" ('325 patent, claim 6)
- "generate mosaic imagery" ('234 patent, claim 1)
- "mosaic imagery along the [first] [second] view" ('234 patent, claim 1)
- "mosaic imagery of progressively different locations along the [first] [second] view" ('234 patent, claim 13)

- "mosaicing the selected outputs of cameras in the [first] [second] path" ('325 patent, claim 1)
- "sequentially mosaicing the selected outputs of cameras in the [first] [second] path" ('325 patent, claim 1)
- "mosaicing the image of a current camera in the sequence to the image of a next camera in the sequence" ('325 patent, claim 5)
- "mosaicing the first image with the second image and then mosaicing the second image with the third image" ('325 patent, claim 6)

40. I understand that Google's proposed construction for "mosaicing" is *creating imagery assembled from a plurality of camera outputs, or portions thereof, including an alignment process and a composition process to achieve a seamless combination of the camera outputs*. Other than the underlined portions, Google's proposal is identical to Kewazinga's proposed construction. However, in my opinion, the additional limitation in Google's proposal that "mosaicing" must be "to achieve a seamless combination of the camera outputs" is inconsistent with how a POSITA would understand the term "mosaicing" and the intrinsic evidence. In addition, I believe that Google's proposal that "camera outputs" (as opposed to images) are a requirement for "mosaicing" is inconsistent with how a POSITA would understand the term "mosaicing" and the intrinsic evidence.

41. As described in the '325 and '234 patents, "mosaicing" is a process for creating imagery assembled from two or more images involving an alignment process and a composition process. *See, e.g.,* Ex. B ('325 patent) at 13:15-28. This is also confirmed by the Burt patent, which is incorporated by reference into the '325 and '234 patents. Ex. B ('325 patent) at 13:17-21; Ex. C ('234 patent) at 17:32-36. I understand that a patent incorporated by reference into

another patent (*i.e.*, a host patent) is considered to be effectively part of the host patent. The Burt patent describes "mosaicing" as a process for creating imagery from a plurality of images (or select portions of those images) including an alignment process and a composition process. *See, e.g.,* Ex. F (Burt patent) at 1:60-65, 2:3-25 (describing alignment process), 2:26-41 (describing composition process), 3:39-48, 5:36-6:60. This is also demonstrated by Figure 3 of the Burt patent which is shown below.

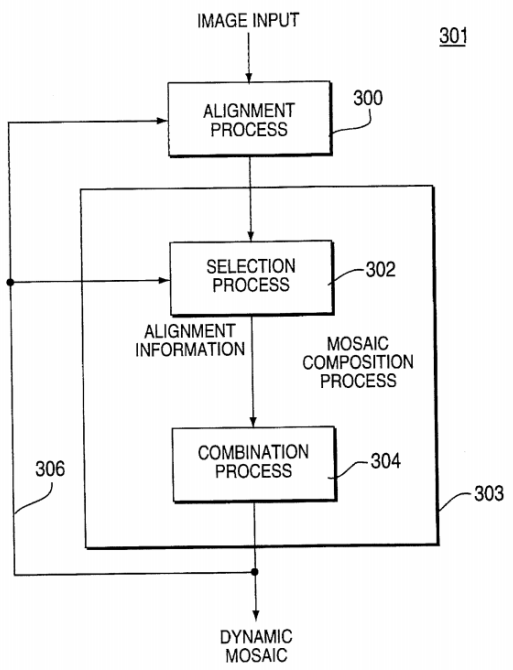


FIG. 3

42. The alignment process involves aligning images that may be part of the mosaic. Ex. B ('325 patent) at 13:21-25. This alignment can encompass aligning the images to a common (or reference) coordinate system. *See, e.g.,* Ex. F (Burt patent) at 2:3-12, 5:60-6:3. As a result the images can be aligned by being placed into the same coordinate system. The composition process involves selecting the images to be included in the mosaic (or portions

thereof) and combining them together. Ex. B ('325 patent) at 13:26-39; Ex. F (Burt patent) at 2:26-41.

43. I understand that the term "mosaicing" in the Asserted Patents was construed as "creating imagery assembled from a plurality of images, or portions thereof, including an alignment process and a composition process" in a prior case, *Kewazinga v. Microsoft*. I understand that this is the same construction for "mosaicing" that Kewazinga has proposed in this case. I have reviewed the *Kewazinga v. Microsoft* Claim Construction Opinion (Ex. G) and agree with the court's adoption of "creating imagery assembled from a plurality of images, or portions thereof, including an alignment process and a composition process" as the construction for "mosaicing," including the court's analysis of the disclosures of "mosaicing" in the '325 and '234 patents and the Burt patent to arrive at that conclusion. Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 10-13. For example, in the *Kewazinga v. Microsoft* Claim Construction Opinion, the court relied on many of the same disclosures in those patents that I have explained show why the intrinsic evidence demonstrates that "mosaicing" refers to "creating imagery assembled from a plurality of images, or portions thereof, including an alignment process and a composition process." Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 10-13.

44. As I noted previously, I believe that Google's proposed limitation that "mosaicing" must be "to achieve a seamless combination of the camera outputs" is inconsistent with how a POSITA would understand the term "mosaicing" and the intrinsic evidence. The ordinary meaning of "mosaicing" to a POSITA does not require that "mosaicing" be "to achieve a seamless combination of camera outputs" (or images) or require processing for such purpose. Although a mosaic can be seamless and this may be desirable for certain applications, a POSITA

would not understand it to be a requirement of "mosaicing." Similarly, although it may be desirable in certain instances to employ efforts (*e.g.*, additional image processing) to reduce or remove seams in a mosaic, a POSITA would not understand that to be a requirement of "mosaicing." The Burt patent makes this clear, explaining that after images are combined to form a mosaic (and, thus, after "mosaicing" has occurred), additional image processing can be performed to make the mosaic seamless. Ex. F (Burt patent) at 1:20-25 ("After processing, the individual images are combined to form a mosaic, i.e., an image that contains a plurality of individual images. Additional image processing is performed on the mosaic to ensure that the seams between the images are invisible such that the mosaic looks like a single large image."). Thus, the mosaic exists and "mosaicing" has occurred regardless of whether any additional image processing is performed, or other attempts are made, to make the mosaic seamless. The Burt patent's use of the phrase "seamless mosaic" demonstrates this as well, differentiating a seamless mosaic from a mosaic that is not seamless. *See* Ex. F (Burt patent) at 4:41-44 ("Furthermore, in composing the mosaic from the aligned images, the system may use any one of a number of image fusing, merging, filtering, and averaging processes to best produce a seamless mosaic."), Abstract. Notably, the claims of the Burt patent also confirm this, describing systems and methods for "mosaicing" that involve an alignment process and composition process but do not require that the "mosaicing" be to achieve a seamless combination of images or involve any additional image processing or efforts to make the mosaic seamless. *See, e.g.,* Ex. F (Burt patent) at claims 1, 11, 24.

45. I understand that in a prior case, *Kewazinga v. Microsoft*, Microsoft proposed that "mosaicing" must result in a seamless image, which was rejected by the court. Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 13-17. The court recognized that the

"Burt Patent makes clear that a mosaic can be formed even if that mosaic is not perfectly seamless." Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 13. The court also noted that there was a "fundamental flaw with the proposed requirement of seamlessness as applied to 'mosaicing'—seamlessness can only be determined *a posteriori*." Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 15. I agree with the court's rejection that "mosaicing" must result in a seamless image for at least those same reasons. I understand that the court stated that its rejection of Microsoft's proposal that "mosaicing" must result in a seamless image did not resolve the question of whether "mosaicing" must include some effort to achieve seamlessness even if that result is not achieved, but the court did not address that issue in the *Kewazinga v. Microsoft* Claim Construction Opinion. Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 14, 17 n.8. As I explained previously, a POSITA would not understand "mosaicing" to require efforts (*e.g.*, additional image processing) to reduce or eliminate seams in a mosaic. *See supra* at ¶ 44. Instead, as confirmed in the Burt patent, "mosaicing" occurs, and a mosaic is created, even if no such efforts to reduce or eliminate seams are made. Ex. F (Burt patent) at 1:20-25 ("After processing, the individual images are combined to form a mosaic, i.e., an image that contains a plurality of individual images. Additional image processing is performed on the mosaic to ensure that the seams between the images are invisible such that the mosaic looks like a single large image.").

46. Google's proposed construction also limits "mosaicing" to creating imagery from a plurality of "camera outputs," or portions thereof. A POSITA would not recognize this to be a requirement of "mosaicing" because "mosaicing" can be performed with images that were not captured by a camera or derived from images captured by a camera. For example, the '234 patent describes "mosaicing" "camera outputs" with "additional source output," which can

encompass "computer graphic imagery, virtual world camera views and virtual world grid data, virtual world imagery, virtual objects and their grid positioning data, applets, sprites, avatar representations, film clips, animation, augmented reality objects or images or recordings of real-world objects." Ex. C ('234 patent) at 12:39-13:2. Thus, the Asserted Patents describe "mosaicing" to create mosaics from more than just "camera outputs." Additionally, the Burt patent describes "mosaicing" without any reference to the term "camera outputs," instead referring to "mosaicing" with respect to any type of images. *See, e.g.,* Ex. F (Burt patent) at 1:20-25, Fig. 3 (describing inputs to "mosaicing" as "Image Input"). Consistent with this intrinsic evidence, a POSITA would understand the ordinary meaning of "mosaicing" to involve creating imagery from a plurality of "images, or portions thereof," and not just "camera outputs, or portions thereof."

B. "array of cameras" ('226 patent, claims 55, 119; '325 patent, 1, 5, 6, 10, 14, 15, 29)

47. Claims 55 and 119 of the '226 patent and claims 1, 5, 6, 10, 14, 15, and 29 of the '325 patent recite "array of cameras." A POSITA would understand that this term refers to *a configuration of cameras wherein the configuration can be created over time by moving cameras*.

48. The '226 and '325 patents make clear that the "array of cameras" used to capture images for users to navigate is a broad term and that the array can take many forms. For example, the "array of cameras" can be any shape and is not limited to a specific or single structure, including a rail or a ring. *See, e.g.,* Ex. B ('325 patent) at 7:34-47 ("For example, the array 10 may be a linear array of cameras 14, a 2-dimensional array of cameras 14, a 3-dimensional array of cameras 14, or any combination thereof."), Figs. 2e, 3, 4, 7a, 11 (depicting different structures of "array of cameras"), Fig. 1 (depicting block diagram of "array of cameras"

as part of invention); *see also* Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 32 n.18. This is consistent with the definition of "array" (*i.e.*, "regular order or arrangement") which does not require a specific or single structure. Ex. H (Random House Webster's College Dictionary (1991)) at 76.

49. An "array of cameras" can be comprised of a plurality of sub-arrays. *See, e.g.,* Ex. B ('325 patent) at Figs. 1, 3, 11; *see supra* at ¶¶ 31-33. For example, in the Figure 11 embodiment, each cylindrical array 12-1 to 12-n comprises a plurality of ring-shaped sub-arrays. Ex. B ('325 patent) at 19:13-16. In addition, array 10 in the Figure 11 embodiment comprises a plurality of cylindrical arrays 12-1 to 12-n sequentially positioned at different locations in the environment at different times. *See supra* at ¶¶ 26-28. Thus, the cameras in the array need not be physically connected to each other. Furthermore, the "array of cameras" can be moveable. Ex. B ('325 patent) at 7:43-44 ("the array 10 can be secured to a moveable frame that can be wheeled into position in the environment").

50. Ultimately, the purpose of the "array of cameras" in the '226 and '325 patents is to capture images at sequential locations through an environment so that users can navigate smoothly and independently along paths through the environment by accessing those images (*see, e.g.,* Ex. A ('226 patent) at 4:22-29; Ex. B ('325 patent) at 4:32-43) and, as disclosed in the Asserted Patents, that can be done where the "array of cameras" is created over time by moving cameras. For example, in the Figure 11 embodiment, array 10 is created over time by moving cameras (labeled as 14) that are part of cylindrical sub-arrays (labeled as 12-1 to 12-n) to different locations within an environment and at different times to capture images. *See supra* at ¶¶ 26-28. Each cylindrical sub-array is positioned to capture and store images, then removed, and then another cylindrical sub-array can be positioned at a new location (and, necessarily, at a

different time) to capture and store images. Ex. B ('325 patent) at 19:41-63, Figs. 11, 12. This process results in the creation of array 10 over time. *See supra* at ¶ 28. After the images are captured by each of these sub-arrays that are moved to form array 10 over time, and stored, users can navigate through the environment by accessing those stored images, including to move forward and backward through the environment by navigating through array 10, including between different sub-arrays that form array 10. Ex. B ('325 patent) at 19:64-20:27. The images captured by array 10 can be mosaiced regardless of whether they were captured at different locations or at different times. Although Figure 11 demonstrates this aspect of the invention with cylindrical sub-arrays, a POSITA would understand that this same principle would apply to arrays formed over time using sub-arrays of other shapes (*e.g.*, linear).

51. I understand that Google's proposed construction for "array of cameras" is *a set of multiple cameras, each fixed in relation to each other*. I understand that this is the construction of "array of cameras" that was adopted by the court in *Kewazinga v. Microsoft*. Although I agree that there is a known relationship between cameras in the "array of cameras" in the '226 and '325 patents, I believe that Google's proposed construction that each camera is "fixed in relation to each other" is imprecise and, depending on the meaning of "fixed in relation to each other," is inconsistent with the intrinsic evidence. *See infra* at ¶¶ 53-55.

52. Though I believe that a POSITA would understand "array of cameras" in view of the intrinsic evidence to mean "a configuration of cameras wherein the configuration can be created over time by moving cameras," in my opinion, an alternative to Google's proposed construction that would be clearer and more in line with the intrinsic evidence is that an "array of cameras" is a "set of multiple cameras, each with a known relationship to each other" (where, as noted above, the array can be formed over time). The fact that the relationship between the

cameras is known is supported by the intrinsic evidence. For example, the '226 and '325 patents describe a relationship between cameras in an "array of cameras" in terms of "the number of camera positions along [an] axis [a] particular camera is displaced from a reference camera." Ex. B ('325 patent) at 5:1-18, 14:41-49, 19:19-26; *see also supra* at ¶ 30. This relationship is kept track of using a coordinate system to identify the cameras in the "array of cameras" with respect to their camera positions relative to one another and the coordinate system permits navigation of imagery along paths through an environment. Ex. B ('325 patent) at 5:1-18, 8:28-9:32, 9:58-64, 19:19-26, Fig. 5. Thus, the relationship between each of the cameras in the "array of cameras" is known, allowing navigation through an environment. This is consistent with the *Kewazinga v. Microsoft* Claim Construction Opinion. *See, e.g.,* Ex. G (*Kewazinga v. Microsoft* Claim Construction Opinion) at 28.

53. On the other hand, to the extent that "fixed in relation to each other" implies that there be exact or uniform distances between the cameras or other precise physical relationship, that is not supported by the '226 and '325 patents. A POSITA would understand the extensive discussion of coordinate systems based on camera positions as opposed to spatial distances, and navigation of images using that coordinate system, in the '226 and '325 patents to mean that there need not be exact distances or uniform distances between the cameras in the array. *See, e.g.,* Ex. B ('325 patent) at 5:1-18, 8:28-9:32, 9:58-64, 19:19-26, Fig. 5. For example, three cameras positioned along an X-axis may be identified with coordinate values X_1, X_2, and X_3 indicating the known relationship between those cameras in terms of camera positions. That relationship in terms of camera positions is known and permits navigation regardless of the exact distances or positioning between each of those three cameras. Thus, there is no requirement that

there be certain distances or particular positioning between each of those three cameras or that the exact distances, as opposed to the relationship in terms of camera positions, be known.

54. Additionally, to the extent that "fixed in relation to each other" implies that the relationship between the cameras be predetermined or known prior to image capture, that is not supported by the '226 and '325 patents. In the Figure 11 embodiment, the decision to position additional sub-arrays that form array 10 over time (and the diameters of those sub-arrays) may be made after the image capture process has already begun and, thus, not at the outset of image capture. *See* Ex. B ('325 patent) at 19:55-59, Fig. 12; *see also supra* at ¶ 29. Thus, the relationship between the cameras in those sub-arrays (and, therefore, the relationship between those cameras in array 10 formed by the sub-arrays) is not necessarily known prior to image capture but, rather, may become known during or after image capture.

55. In addition, the use of the word "fixed" is imprecise because the '226 and '325 patents do not require the cameras in the array to be stationary. The Asserted Patents explain that the "array of cameras" "can be secured to a moveable frame that can be wheeled into position in the environment." Ex. B ('325 patent) at 7:43-44. In addition, the Figure 11 embodiment involves moving sub-arrays with cameras to different locations at different times to capture images, which creates an "array of cameras" (labeled as 10 in Figure 11). *See supra* at ¶¶ 26-28.

I, Jeffrey Lubin, do hereby declare and state, that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on October 16, 2020 at Princeton, NJ.

Jeffrey Lubin, Ph.D.